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21 August 1961

NRO REVIEW COMPLETED

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MEMORANDUM FOR:  DPD-DD/P  
THROUGH: Chief, Technical Plans and Development Staff, NPIC  
SUBJECT: Meeting on the Auxiliary Framing Camera for the "M" Program  
16 August 1961

1. Attendance (Pentagon)

2. Purpose

To conduct discussions with the intelligence and cartographic users of the proposed photography in order for LMSD - Itek to better understand data reduction procedures and requirements, to help in decisions in auxiliary framing camera mounting problems, orientation procedures, etc.

3. Auxiliary Framing Camera Data

Lens - f 4.5 Zeiss design capable of 200 lines per millimeter on axis, with a speed of T 6 (without filter) on S.O. 132, and with an angular coverage of 74 degrees.

Film - 70mm x 100' length.

Platen - A constant tension of five ounces and a precision machined pressure plate will aid in proper film alignment on the platen. A Réseau (back lighted) is being considered.

Stereo - 60% (14% - 1%) is planned.

Shutter Speeds - 1/500 second, 1/250 second, 1/125 second. Compur shutter rated at 80% shutter efficiency.

Power Supply - The camera has no power of its own, but utilizes the energy provided by the take-up spool.

Film Take Up - At present there is no way of knowing how much film is on the take-up roll.

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Approximate Scale - 1/7,000,000.

Time - Several techniques are available including incorporating a second null timing mark on the master camera frame to allow time correlation between cameras and system time.

Data Chamber - Serial numbers are being considered.

#### 4. Problem Areas

A. Calibration Procedures - [ ] suggested Headquarters establish a group to include NPIC and ACIC to establish the calibration procedures to be followed by LMSD. Mr. Lane of ACIC and the undersigned discussed the advantages of stellar techniques presently established.

B. Camera Mounting - It appears the best place to mount the auxiliary framing camera is on the fairing rather than on the bridge of the dual camera mount. The mounting of this camera on the fairing of thin skin will suffer vibration on ascent and thermal deformation, but appears to be an acceptable solution.

C. Relative Orientation Procedures - Mr. Lane (ACIC) commented that the method planned for the exterior orientation of the camera was by classic space resection techniques from known geodetic ground control. (He stated an average of 10 points per frame were available in the prime areas of interest.) These techniques are not based on a requirement for a precise relative orientation determination. The elements of orientation determined from the horizon cameras (pitch and roll) would be used by ACIC for first approximations in their iterative solution accomplished on the RCA 501 Computer. Mr. Lane did state that relative orientation between the auxiliary camera and the dual mounted panoramic cameras would be beneficial.

The NPIC comments regarding the relative orientation of the cameras can be generalized as follows: The prime advantage of the auxiliary framing camera for NPIC is the advantage of having a base to tie the dual camera panoramic photography and, in addition, would have value in yaw analysis. Without the auxiliary framing camera, yaw analysis of panoramic photography is very difficult because of the problems caused by Coriolis acceleration, and image motion. Therefore, NPIC would like to see further recommendations from LMSD on how a relative orientation procedure may be established; what accuracies could be realized; and further would appreciate an analysis from LMSD concerning the misalignment of the cameras after take off caused by vibration, thermo problems, possible deformation of fairing, etc.

D. Separate Program for Auxiliary Framing Camera - Mr. Lane suggested that it would be of advantage to have the auxiliary framing camera be programmed to operate independently of the dual stereo cameras. This independent operation would allow for cartographic photography over areas of good control and would probably aid in improving ephemerides.

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Speaking off the cuff, the NPIC member wasn't sure classic cartographic techniques would result in better ephemeral data considering that by the time the "M" program is in operation, better tracking facilities, faster and more accurate computer programs, etc., would result in an ephemeris of higher accuracy than presently available.

5. A meeting is planned for 12 September on the West Coast for final discussions on the problem areas relative to the auxiliary framing camera.

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[REDACTED]  
Acting Chief, Technical Development Branch  
Technical Plans and Development Staff  
National Photographic Interpretation Center

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